

# **SUPPLEMENTAL SPECIFICATIONS**

**WSF 002**

**ELECTRICAL INSTALLATION SPECIFICATIONS**

**REVISION 09/02**

## **ATTACHMENT NO. 2**

### **WASHINGTON STATE FERRIES**

#### **ELECTRICAL INSTALLATION SPECIFICATIONS**

**REVISED 09/02**

##### **ELECTRICAL MODIFICATIONS - GENERAL**

New and modified electrical systems shall meet the following general electrical requirements:

- A. Provide labor, material and equipment to mark each new or modified cable with its circuit number and cable type by use of a raised-letter embossed aluminum tag wherever a cable enters an enclosure of any type or penetrates a deck or bulkhead. Cables shall have identification labels on each side of deck or bulkhead penetrations and at any other location where both sides of the penetration are not readily visible for cable tracing. Care shall be taken that the correct cable tag is installed on each cable and in every location where required. Assign a unique cable number to each separate piece of cable installed by the Contractor. For circuits that branch, or are connected at junction boxes, lighting fixture, etc., the basic cable number shall remain the same through the circuit. A bracketed dash number (-X) identifier shall be appended to each individual cable or wire starting with the lowest number at the power or signal source and increasing to the farthest load of the circuit. Provide new power/lighting typed panel directory cards for panels that have new or modified circuits. The circuit designation and load description of the circuit shall be typed on the card to correspond exactly with the final as-built condition of the Vessel.
- B. Provide labor, material, and equipment to mark each individual wire for all new or modified circuits with identification floaters. Floaters will not be required for power or lighting cables. These floaters shall be provided and installed and be white polyolefin with permanent black typewritten lettering. The floaters shall be RAYCHEM-TMS (Terminal Marker System) or equal. Hand written letters or wire marker tape floaters will not be accepted. The correct circuit number shall be indicated on one line of each floater. On the second line of the floater, the terminal identification number shall be shown. The terminal identification number shall consist of the termination block and the termination point identification and the individual conductor identifier within the cable. Spare conductors and jumpers shall also be fully identified by this method.

- C. All control wiring terminations shall be made to terminal boards using ring lugs under compression terminal connections. No more than two (2) wire terminations shall be placed under each screw of a terminal board exclusive of jumpers. All terminal lugs shall be installed using a manufacturers approved controlled-cycle crimping device.
- D. Each new or modified cable shall be tested for continuity. Record the origin and destination terminal designations to verify agreement with drawings for new, modified and/or relocated equipment and the approved electrical drawings. Record the date each circuit is checked, calibration date of the test equipment and the name of the person performing the test. Record actual resistance values observed during each test rather than noting that the value is satisfactory. After testing is complete, restore the system to operational status.
- E. All cable provided and installed by the Contractor shall be Low Smoke per Mil-C-24643A. Open up and restore existing cable transits and wireways as necessary. Provide new penetrations when needed. Bulkhead and deck cable penetrations shall maintain the watertight and fire rating of the boundaries penetrated and shall be installed and suitably protected to satisfy USCG requirements. Provide new cable to reconnect existing equipment that was relocated due to this modification, if the existing cable is too short. Remove all existing cable rendered useless by this modification. There shall be no more than two (2) cables entering any relocated or reconnected light fixture.
- F. In locations where cables will penetrate a bulkhead or deck, a USCG approved method, shall be utilized. In locations where stuffing tubes are used, the clear distance between adjacent stuffing tubes shall be no less than one and one half (1-½) the diameters of the largest stuffing tube of the two (2). Cables transiting bulkheads and decks shall maintain the fire-tight/water-tight capability of the bulkhead or deck as existing.
- G. All new cable banding, and replacement of existing cable banding where disturbed by the work, for interior and exterior, shall be stainless steel, using flexible channel rubber between the banding material and the cable. The use of nylon ty-raps as cable retention devices will not be allowed. Unless otherwise specified, cable shall be installed in accordance with IEEE Standard 45, Clause 10 (except 10.11) and 13, and 46 CFR 111.60.
- H. Route new cables in existing wire ways as much as practical. All new exterior cable hangers, clips and attachments shall be stainless steel. The entire vehicle deck, curtain plate, machinery casing exterior and the underside of the passenger deck shall be considered exterior surfaces.

- I. All new fiber optic cable installations will be tested to the following requirements:
- a) Test Equipment requirements. Optical time domain reflectometer (OTDR). The OTDR is used for estimating the attenuation rate of a fiber, and locating the nature and location of defects in an optical link.
  - b) Specified Limits. The cable is considered satisfactory if the maximum measured attenuation for each fiber does not exceed the vendor's attenuation data by greater than 1 db/km.
  - c) Acceptance/pre-installation tests. Fiber optic cable and associated components shall undergo visual inspection prior to installation in the cableways to verify that it is mechanically sound. Inspect fiber optic cable with OTDR to verify it is optically sound and within specified limits.
  - d) Installation tests. After the cable is installed in the cableways, the pre-installation tests shall be repeated to verify that fibers were not broken or damaged when the cable was pulled through the cableways.
  - e) Post-Installation tests. After all fiber optic cable topology links have been installed, tests using optical inspection with OTDR, shall be conducted to verify that the end-to-end attenuation of the fiber optic cable topology is within specified limits.